



EPA proposes action on North Potato Creek

Copper Basin Mining District Site
Polk County, Tennessee

EPA Region 4 Fact Sheet

EPA invites public comment on treatment action proposed for portion of North Potato Creek; open house set for March 13

IMPORTANT DATES

Public Comment Period

February 28 to March 30, 2003

Open House

Thursday, March 13, 2003

3 p.m. to 7 p.m.

Office of Glenn Springs Holdings, Inc.
127 Main Street, Ducktown, TN

Information is available for review

at the Copper Basin Information Repository
in the rear of the Chamber of Commerce
office on Main Street in Ducktown,
and online at:

www.epa.gov/region4/waste/copper

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The U.S. Environmental Protection Agency (EPA) invites community members to attend an open house (also known as an availability session) on Thursday, March 13, from 3 p.m. to 7 p.m. at the office of Glenn Springs Holdings, Inc., 127 Main Street in Ducktown, Tennessee.

The open house will feature the results of a study, formally called an Engineering Evaluation and Cost Analysis (EE/CA or Evaluation), in which options were evaluated for treating water in the lower portion of North Potato Creek before it enters the Ocoee River. Glenn Springs Holdings, Inc. (GSHI) conducted the study under a legal agreement with EPA signed in January 2001. The EE/CA is one of several activities in the ongoing investigation and cleanup of the Copper Basin Mining District site in southeast Tennessee.

EPA will accept public comments on the alternatives considered in the Evaluation and on the recommended action for North Potato Creek from February 28 through March 30, 2003. Community members will have the opportunity to review, ask questions, and discuss the Evaluation and proposed action with representatives of EPA and GSHI at the March 13 session.

The purpose of this fact sheet is to provide a summary of the alternatives evaluated in the North Potato Creek EE/CA and to encourage the public to comment on the alternatives and the proposed removal action. The fact sheet also summarizes the Copper Basin site history and the status of site activities.

Copper Basin Site History

The Copper Basin Mining District site covers a large area in the mountains of southeast Tennessee. Extensive copper mining and processing operations in the Copper Basin began in the 1850s and continued until 1987.

For decades, mining and related processing activities provided economic stability in eastern Polk County and the towns of Copperhill and Ducktown. Many individuals and companies were involved in mining, refining, and manufacturing operations. At its peak, the Polk County copper industry employed more than 2,500 people.

Mining and related activities resulted in various environmental effects. By the late 1800s, forests in the Copper Basin were clear-cut to provide fuel for open roasting of ore. Sulfur dioxide emissions from the roasting yards destroyed the remaining vegetation, resulting in extensive topsoil erosion and a denuded landscape.

Mining, mineral processing, and sulfuric acid production generated waste rock, slag, tailings, and debris. Over the years, surface runoff carried soil and waste materials into the streams. Due to acid rock drainage in Copper Basin and waste from various sources, North Potato Creek, Burra Burra Creek, and Davis Mill Creek contain metals and have acidic conditions that will not support fish and other aquatic life.

Site investigations and regulatory actions related to spills, water quality, and other issues have taken place before and since the mines closed. Various actions have been carried out by private parties under legal agreements with EPA and the State of Tennessee. Water and/or wastewater treatment facilities have been constructed to address conditions in the North Potato Creek and Davis Mill Creek watersheds. Watershed refers to the land that produces storm water runoff and contains streams that run into a specific creek or river.

Numerous private and public water wells have been tested in the Copper Basin area. None of the wells has shown any site-related substances at levels of concern. Several rounds of sampling have also occurred in the Ocoee River. In 1996, in response to questions about the river's suitability as an Olympic venue, EPA stated

that metals in the river were not present at levels that would cause concerns for recreational use. EPA collected additional data on the Ocoee River during the past year, and is preparing a human health and ecological risk assessment expected to be available in late 2003.

Current Site Status

In January 2001, representatives of EPA, the Tennessee Department of Environment and Conservation (TDEC), and GSHI signed a Memorandum of Understanding and several other legal agreements to address site hazards and other environmental concerns. The legal agreements require certain site investigations and study activities to determine appropriate cleanup actions. Interested readers can find copies of the agreements and other documents that provide more details about site activities in the locations listed under **Where to Find More Information** on page 8 in this fact sheet.

Figure 1 shows the areas that are the focus of investigation and cleanup activities for the Copper Basin site. The site includes portions of the North Potato Creek watershed, the Davis Mill Creek watershed, and the Ocoee River from the point where Davis Mill Creek enters the river downstream to Parksville Reservoir.

Beginning in early 2001, several work plans have been developed and investigation activities undertaken in several site locations. Progress has been made in removing many site hazards, including mining structures, debris, and transformers with polychlorinated biphenyls (PCBs). Additional fencing is being installed to keep people out of dangerous areas, including mine collapses. Revegetation is being done on the upper tailings pond and other areas.

The subject of this fact sheet is a study required by an Administrative Order on Consent signed by EPA and GSHI to identify water treatment options for the South Mine Pit and lower portion of North Potato Creek shown in Figure 2. The study, formally called an Engineering Evaluation and Cost Analysis (EE/CA), is part of a non-time-critical removal action to develop a temporary treatment system until an overall plan can be implemented to improve water quality in the North Potato Creek watershed.

Objectives and Study Area Description

The Evaluation was conducted to identify a temporary water treatment method for the lower North Potato Creek and South Mine Pit that would meet the following objectives identified in the Administrative Order on Consent:

1. Reduce substances of concern in the flow of North Potato Creek into the Ocoee River.
2. Protect human health and the environment.

In addition, the Order requires that the removal action be capable of treating flows that could occur in North Potato Creek if a 10-year, 24-hour storm event occurred.

The study area for the Evaluation, shown in Figure 2, covers approximately 220 acres in the North Potato Creek watershed. The area includes three former underground mines (the Tennessee, Cherokee, and Westervelt) and two surface mines (North Mine Pit and South Mine Pit). All five mines were developed in or adjacent to North Potato Creek, a short distance from where it enters the Ocoee River.

Other mines and facilities in the North Potato Creek watershed are outside of, but may affect, the study area. The Central Shaft and Boyd Mines are a little more than a mile northeast of the area, and the London Mill water treatment plant is approximately 2.6 miles north on Burra Burra Creek, a tributary of North Potato Creek.

The North Mine Pit was excavated in the mid-1970s. The original channel of North Potato Creek ran through the mine pit area. As a result, a diversion channel was dug to relocate the flow of North Potato Creek around the west part of the pit.

The South Mine Pit was mined from the late 1970s through the mid-1980s. The surface mine intercepted the works of the three underground mines named above. Soil and rock from the South Mine Pit were used to fill the North Mine Pit and placed in fills north and west of the pit. The North Potato Creek diversion channel was extended and used to route the flow around the South Mine Pit.

When mining operations stopped in 1987, water removal from the underground mines in the area was halted, and by 1991, the South Mine Pit was

approximately one-fourth filled with water. EPA then ordered the flow of North Potato Creek to be diverted into the South Mine Pit to prevent sediment transport to the Ocoee River, and the entrance to the diversion channel was blocked.

As shown in Figure 2, North Potato Creek now flows into the South Mine Pit at the north edge and exits at the south edge. Water leaving the pit flows four-tenths of a mile to the point where North Potato Creek enters the Ocoee River. The South Mine Pit has a surface area of approximately 20 acres and a maximum depth of about 200 feet.

Study Findings

The Evaluation report identifies surface water in North Potato Creek as the primary source of contamination in the study area. Upstream of the South Mine Pit, North Potato Creek is affected by acid rock drainage and runoff from waste materials in the watershed.

Flow monitoring and analysis of water samples showed that the rate of flow and the water quality in North Potato Creek as it enters the study area vary greatly. Factors such as rainfall and runoff that affect the creek's flow and water quality were taken into account in evaluating treatment alternatives.

The London Mill treatment plant uses conventional lime neutralization to treat runoff from the upper tailings pond and the London Mill flotation plant area, and water from the McPherson and Isabella mines. The plant normally operates eight hours a day, five days a week. The on/off cycling and the volume and alkalinity of treated water discharged from the treatment plant caused changes in North Potato Creek water quality.

Factors that affect conditions in the South Mine Pit were also important in the Evaluation. These factors include wind, rainfall, and runoff within the South Mine Pit area, chemical reactions and characteristics of the water in the pit, groundwater seepage into the pit, and water flowing from North Potato Creek into and out of the pit.

Various types of data were collected over a period of approximately 12 months to be used in evaluating treatment options. Devices called weirs were installed to measure the volume of water flowing into and out of the South Mine Pit under normal and storm flow conditions. Flows into the pit ranged from 4,000 to

50,000 gallons per minute, with a yearly average of approximately 8,000 gallons per minute.

Numerous measurements and samples were taken to analyze the characteristics and quality of water in North Potato Creek and the South Mine Pit. Tests were also done to determine differences in water conditions at various depths of the South Mine Pit.

In addition, treatability studies were done in the laboratory and in the field to test various ways of treating the water. By simulating the treatment process, the studies showed effective ways to remove the metals of concern.

Detailed findings are provided in the Evaluation report available in the information repository.

Results of Risk Evaluation

Key objectives for the removal action are to reduce substances in North Potato Creek entering the Ocoee River and to protect human health and the environment. A streamlined risk evaluation was performed to identify potential effects on living things that might come into contact with substances of concern in the study area. The risk evaluation assesses the risks of exposure if no action was taken to address current conditions.

Potential human health risks were evaluated by considering whether people could come into contact with substances in North Potato Creek between the South Mine Pit and the Ocoee River. Access to the area is restricted, making it unlikely that people would use the creek. According to the risk screening, if trespassers were exposed to water in the creek, they would not be exposed to a significant risk.

Impacts on aquatic life in the South Mine Pit, North Potato Creek, and the Ocoee River are therefore the principal focus of the removal action. Based on data collected in the study area, the ecological risk screening identified aluminum, copper, iron, zinc, and pH (degree of acidity or alkalinity) as the substances that pose the greatest potential risk to aquatic life in water flowing out of the South Mine Pit to North Potato Creek. Other metals were identified as contributors to potential ecological risk.

Evaluation of Removal Action Alternatives

Nine alternatives were initially considered as potential removal action alternatives:

1. No Action (required alternative). No water treatment would occur; sediment removal would continue in the South Mine Pit.
2. In-Pit Treatment with three sub-alternatives. Each sub-alternative uses alkaline compounds to treat the water, and the South Mine Pit is used for settling of solids and control of the discharged water. Alternative 2 was a starting point, and refinements were made in Alternatives 2A, 2B, and 2C to improve the results.
3. Conventional Lime Treatment 3A and 3B. In these two sub-alternatives, water would be treated in a treatment facility using lime to neutralize pH, followed by aeration and settling in conventional clarifiers. The sub-alternatives differ in the volume of water that would be treated.
4. Diversion of North Potato Creek and separate treatment of North Potato Creek and South Mine Pit. The creek would be diverted and treated separately in a conventional lime treatment facility.
5. Sodium Hydroxide Reactant, also known as caustic soda, would be used instead of lime to neutralize the pH of the water.
6. Micro-Encapsulation. Silica micro-encapsulation is a process that uses a calcium/silica-based compound that causes metals to settle into a sand-like sludge.
7. Reverse Osmosis. Fluids would be purified by passing through a semi-permeable membrane.
8. Passive Wetlands. An environment would be created to allow natural physical and chemical reactions to reduce sulfates, remove metals, and adjust pH without mechanical systems.
9. South Mine Pit Backfill. Approximately 3 million cubic yards of clean fill would be placed in the pit, and North Potato Creek would be routed around the pit in the existing diversion channel.

These alternatives were screened according to EPA guidance for conducting an engineering evaluation and cost analysis. Three criteria were used initially to evaluate each of the alternatives and sub-alternatives: effectiveness, implementability, and cost.

Effectiveness of the alternatives is based on meeting the removal action objectives (protecting human health and the environment and reducing discharge of substances to the Ocoee River) and specified scope of the evaluation (treating flow in a 10-year, 24-hour storm). Although the No Action alternative would not meet this criterion, it was retained for further analysis to meet EPA requirements.

The effectiveness of alternative 2 was rated poor in reducing contamination, and alternatives 2, 2A and 2B could not meet the storm flow conditions. Alternative 3B would treat only a portion of the storm flow, and alternative 9 would provide no treatment. These alternatives were eliminated from further screening.

Implementability refers to the technical and administrative feasibility of implementing the alternative. Technical feasibility includes the complexity of the system's operation and maintenance requirements, its reliability, and construction, logistical, and schedule considerations. Administrative feasibility refers to coordination with regulatory agencies, obtaining permits, and complying with applicable laws.

Alternative 5 raised concerns about implementability because it would require additional safety precautions for plant operators handling caustic soda. Alternative 7 would require pretreatment and maintenance aspects that make it difficult to implement. Alternative 8 was eliminated because the space required to construct a passive wetlands system is not available in the study area.

Cost of an alternative includes the capital cost of construction and post-removal site control costs, which include operating and maintenance costs. Although the Administrative Order set a maximum capital cost of \$6 million, the Evaluation work plan used five times that amount, or \$30 million, as a maximum cost for consideration of an alternative.

Construction and post-removal costs estimated at approximately \$41 million eliminated alternative 4 from

further consideration. The caustic soda used in

alternative 5 would cost about 10 times more than lime used in other alternatives, and safety considerations would also add to maintenance costs. Alternative 6 was eliminated due to questions about its effectiveness and post-removal site control costs, which range from \$15 million to \$25 million per year. Alternative 7 was eliminated because its capital costs would be much higher than the maximum.

Detailed Alternative Analysis and Recommended Removal Action

Detailed analysis and comparisons were conducted for alternatives 1: No Action, 2C: In-Pit Treatment, and 3A: Conventional Lime Treatment. These alternatives were further analyzed according to the three overall criteria described above, with sub-criteria identified in EPA guidance. The 21 sub-criteria are grouped and summarized in nine categories shown below.

Criteria for Detailed Analysis of Removal Action Alternatives

Overall protection of public health and the environment

Short-term effectiveness and protection of workers during implementation

Long-term effectiveness and ability to maintain control until a long-term solution is implemented

Ability to meet federal and state requirements

Ability to achieve removal action objectives by reducing the mobility, toxicity, and volume of substances

Technical and administrative feasibility of implementing the removal action

Costs, including capital and post-removal site control

State acceptance regarding technical and administrative concerns

Community acceptance regarding construction, operation, and other aspects of the action

The detailed evaluation and comparison of the three remaining alternatives showed that alternative 2C, In-Pit Treatment, rated highest overall. The No Action alternative would not meet the removal action objectives. Alternatives 2C and 3A, Conventional Lime Treatment, were rated equal on 16 of the 21 sub-criteria.

In-Pit Treatment was rated better in comparison to Conventional Lime Treatment on the five remaining criteria:

- " Effectiveness - protective of the environment
- " Implementability - construction and operational considerations
- " Implementability - adaptable to environmental conditions
- " Costs
- " Community Acceptance

Alternative 3A would cost approximately \$28 million to construct, versus \$3.8 million estimated for 2C. Public acceptance was rated lower for 3A because the water level of the South Mine Pit would need to be drawn down to collect storm flows, resulting in unsightly exposed banks.

EPA's Proposed Action

EPA is recommending alternative 2C, In-Pit Treatment, as the removal action that will best meet the intent of the Administrative Order on Consent.

The recommended in-pit treatment system would treat the water in North Potato Creek before entering the South Mine Pit. As shown in Figure 3, a dual lime feed system would be used to treat both base flows and storm flows equal to a 10-year, 24-hour storm. The water would be mixed and aerated, then discharged into the creek channel just north of its entrance to the pit. Solids would settle out in the pit before water flows into the downstream stretch of North Potato Creek and into the Ocoee River.

A full-scale field treatability study conducted at the South Mine Pit provided valuable data that supports the implementation of alternative 2C. This method would

be effective in meeting the objectives for reducing the

substances of concern and neutralizing the pH in North Potato Creek to appropriate levels before entering the Ocoee River. It would protect human health and the environment, is implementable, and meets federal and state laws. The capital cost is estimated at \$3.8 million and annual post-removal site control cost is estimated at approximately \$600,000 per year.

Where to Find More Information

EPA encourages interested individuals to review the Administrative Record, which includes a copy of the *Engineering Evaluation and Cost Analysis for North Potato Creek Watershed, Ducktown, Tennessee, February 2003*.

The Administrative Record contains all documents related to the non-time-critical removal action for North Potato Creek. The Administrative Record and a copy of the EE/CA report are available at:

Copper Basin Site Information Repository

Polk County/Copper Basin Chamber of Commerce
134 Main Street, Ducktown, Tennessee
Phone: (423) 496-9000
Hours: Monday - Friday, 9 a.m. to 5 p.m.

The Evaluation report is also available for review at:

Glenn Springs Holdings, Inc.

127 Main Street, Ducktown, Tennessee
Phone: (423) 496-7900
Hours: Monday - Friday, 8 a.m. to 5 p.m.

Community members are invited to attend an open house (availability session) on Thursday, March 13, at the office of Glenn Springs Holdings, Inc. any time from 3 p.m. to 7 p.m. Information and displays about the Evaluation and recommended removal alternative will be available. Representatives from EPA, TDEC, and GSHI will be on hand to discuss the information and answer questions.

EPA will accept public comments on the North Potato Creek Engineering Evaluation and Cost Analysis and proposed removal action from February 28 through March 30. EPA will consider all public comments before making a final decision on the removal action.

ITEMS TO REMEMBER

Public Comment Period

February 28 to March 30, 2003

Open House

Thursday, March 13, 2003

3 p.m. to 7 p.m.

Office of Glenn Springs Holdings, Inc.

127 Main Street, Ducktown, TN

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EPA Toll-free number: 800-435-9233

PUBLIC COMMENT SHEET

for North Potato Creek Removal Action

EPA encourages public input as an important contribution to the site cleanup process. Please send comments on the Engineering Evaluation and Cost Analysis and the recommended removal action for the North Potato Creek watershed, postmarked no later than March 30, to:

Loften Carr, Remedial Project Manager
U.S. Environmental Protection Agency
Waste Management Division (11th Floor)
61 Forsyth Street, SW
Atlanta, GA 30303-8960

Phone: 404-562-8804
Fax: 404-562-8788
E-mail: Carr.Loften@epa.gov
Toll-free: 800-435-9233

Name: _____ Phone: _____

Address: _____ City/State: _____ Zip: _____

Comments: _____

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